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GEOGRAPHICAL SOCIETIES OF AMERICA

BY J. PAUL GOODE,
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THE International Congress of Geographers will meet at Washington, D. C., on invitation of the National Geographic Society, in 1904. This is an event of far reaching importance to geography in this country, and one that ought to win the support of every geographic society and every earnest student of geography in the land. Every society should be represented at the meetings, and other societies ought to organize, so that this country could show itself alert to the great interest which enlists the earnest attention of the various European peoples, and to which we are not yet sufficiently alive.

There has never been any society sufficiently powerful to enlist affiliation of all other societies with it. Up to date all our organizations have been more or less local in their interests and ambitions, and very largely in the dark as to what has been doing in the various local centers. So it may not be out of place to take a census of the various geographic societies, and to publish a brief summary, setting forth their aims, with some slight historical data, and presenting in one place a bit of information which will help to put each society in touch with all the others. This will contribute toward the union which should come at some future day, when all our present societies, with others yet unformed, shall coördinate their work and be of mutual assistance, with common interests, in a truly rational way.

Early in 1902 letters were sent to the secretaries of all the geographic societies known to the writer, asking for the date of organization, aims, publications, explorations, medals, and prizes, conditions of membership, number of members and a list of officers. From the data thus collected and with later revision, the following summary is prepared. The societies which have reported are entered according

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to date of organization, so far as known to the writer. Any societies overlooked or those which shall in future organize will confer a favor upon the JOURNAL OF GEOGRAPHY, by sending a historical and descriptive note which can be published later.

THE AMERICAN GEOGRAPHICAL SOCIETY

The American Geographical Society was founded in 1852. One of but twelve similar societies at that time, it now exchanges its publications with three hundred scientific associations scattered throughout the world.

The objects of the American Geographical Society are: "The discussion and diffusion of geographical information; the promotion of the exploration of our territory, and of the survey and preservation of our harbors; the establishment in the chief maritime city of the Union of a place where will be afforded the means of obtaining accurate information of every part of the globe; and the registration and careful record of discoveries and studies in geography and the related sciences."

The society was lodged for more than twenty years, under very unfavorable conditions, at No. 11 West 29th Street, New York City. It is now permanently settled in the new and specially designed fireproof building No. 15 West 81st Street, which the generosity of its friends has enabled it to acquire. This will afford perfect security to the large and growing library—one of the foremost geographical libraries of the world; to the thousands of maps and charts, and to the remarkable collection of atlases of the sixteenth, seventeenth and eighteenth centuries, now in the map room, and will also provide ample accommodations for readers and students.

Travelers, men of science, and others properly accredited, are welcome at the rooms of the society, and freely offered the use of library and collections.

Two gold medals have been founded by the society, the Cullom Geographical Medal, and the Charles P. Daly Medal, which are awarded from time to time to explorers and men of science who have contributed to the advancement of geographical knowledge.

The Bulletin of the society, published five times a year, contains papers read and contributed, the transactions of the society and the geographical news of the world, and forms, when bound, at the end of the year, a volume of five hundred pages.

Annual dues, ten dollars; life fellowship, one hundred dollars. No special qualification for fellowship is required, other than interest

in the spread of knowledge and the advancement of science. There are now seven honorary members, thirty-one corresponding members, and twelve hundred seventy-two fellows. The current lecture season began November, 1902, and closes April, 1903. No explorations are now in progress, though an expedition to the remoter provinces of China is under contemplation by Mr. Frank H. Nichols, under the auspices of the society.

The office of president, left vacant by the resignation of Mayor Seth Low, was filled on January 27, 1903, by the election of Commander Robert E. Peary; Domestic Corresponding Secretary, Chandler Robbins, 15 West 81st Street, New York City.

THE APPALACHIAN MOUNTAIN CLUB

The Appalachian Mountain Club of Boston was organized in 1876. It is a society whose first purpose is the study of mountains, this being supplemented by an effort to bring people nearer to nature. In its mountain work it has explored and mapped out the White Mountains as its own particular field, but has by no means neglected other mountain regions at home and abroad. In its allied field of forestry and the preservation of places of picturesque and historic value, it is the parent society of park commissions, and acts as trustee of public reservations in Massachusetts and other states. It has accepted and keeps open for public use parks or reservations now numbering ten, presented to it in Massachusetts and New Hampshire. In the mountains, in addition to preparing and issuing trustworthy maps, it has constructed paths and built camps and refuges.

The club holds monthly meetings in Boston, where it maintains a library and social parlor, and affords to its members opportunities to visit and study mountains by organizing excursion parties, in winter as well as in summer, which, under the care of persons familiar with the places visited, have unusual facilities for tramping or study. It publishes a magazine, "Appalachia," now in its tenth volume, also an annual Register, and from time to time issues maps and guide books. Membership, twelve hundred and seventy.

Secretary, J. Ritchie, Jr., No. 581 Warren Street, Roxbury, Mass.

QUEBEC GEOGRAPHIC SOCIETY

The Quebec Geographic Society was founded in 1880 with two hundred members, but its membership has been much reduced. The society published a series of annual bulletins up to 1897, the latest being

a series of brochures on the Hudson Bay region. The officers are: President, Major Navaire Levasseur; Secretary and Treasurer, Chavalier Ovideo Frechette; Librarian, Chevalier Ch. Baillargé, C. E., F. R. S. E.

AMERICAN CLIMATOLOGICAL ASSOCIATION

The object of this association is the study of Climatology and Balneology, as factors in health and disease.

Sessions are held annually, the meeting-place every third year being Washington, D. C. In 1901 the meeting was held at Niagara Falls; in 1902, at Los Angeles.

The transactions are published in an annual volume. Price three dollars. Annual dues, five dollars.

President, Samuel A. Fish, M. D., Denver, Colorado; Secretary, Guy Hinsdale, M. D., 3943 Chestnut Street, Philadelphia.

THE NATIONAL GEOGRAPHIC SOCIETY

The National Geographic Society was organized in 1888 at Washington, D. C., to take advantage of the presence in the city of all the officers of the government engaged in the scientific exploration and survey of its vast territory, and also to enlist the coöperation of eminent representatives of other governments at the National Capital.

In pursuance of its constitutional object—"the increase and diffusion of geographic knowledge"—this society has performed from the first a double function; (1) that of promptly presenting to the American people the principal results of geographic explorations and research, and (2) affording to the geographic workers of the National Capital opportunity for the publication, through an agency popular yet authoritative, of information that might otherwise have been buried in voluminous reports, more or less delayed in publication and perhaps too technical for popular reading.

At a meeting of the society held April 19, 1901, new by-laws were adopted, looking toward giving the society a more national character, bringing its organization into complete harmony with its title. Some of the changes are: There is no longer any distinction between active or corresponding members—all are now members; annual dues, two dollars; life membership, fifty dollars; admission to lectures is no longer a prerogative of membership, but members are given more favorable terms; the number of managers has been enlarged to twenty-four, with the proviso, that at least six shall be selected from members residing outside the District of Columbia. The vacancies on the Board of Managers, created by the enlargement of the Board, have been

filled by the election of Mr. Russell Hinman, New York City; Professor Wm. M. Davis, Cambridge, Mass.; Professor Angelo Heilprin, Philadelphia; Professor George Davidson, San Francisco; Dr. D. C. Gilman, Baltimore; Professor R. D. Salisbury, Chicago, Ill., and Professor I. C. Russell, Ann Arbor, Mich.

The society began with one hundred sixty-seven members, and has at present about twenty-six hundred. At a recent meeting a change in organization was adopted, creating a special form of membership to be known as "fellows," the prerequisite for which is an acceptable degree of scientific training or contribution to the science of geography, but no elections have as yet been held. The official journal of the society, the *National Geographic Magazine*, published for the first eight years at irregular intervals, and as the transactions of a scientific society rather than as a magazine of general geographic information, has since January 1896, been issued monthly. The society has given assistance to various scientific expeditions, the latest one of which in 1902 studied the volcanic phenomena in the island of Martinique. Prizes are also offered for the best essays on designated subjects of geographic interest. The society has recently moved into a handsome new home, at 16th and M Streets, in the residential part of Washington. This home, costing $65,000 was erected as a memorial to the first president of the society, Hon. Gardiner Greene Hubbard.

Of the twenty-six hundred members, seventeen hundred live outside of Washington, well distributed over all North America.

President, Alexander Graham Bell; Vice-president, W. J. McGee; Secretary, A. J. Henry, 107–108 Corcoran Building, Washington, D. C.; editor, Mr. Gilbert H. Grosvenor.

GEOGRAPHICAL SOCIETY OF CALIFORNIA

The Geographical Society of California was incorporated 1891. The objects of this society are: The publication of new geographical material; the accumulation of a library of the best books, maps and charts, documents and materials, such as may convey the best information to persons intending to visit foreign countries; to prepare brief instructions for intending travelers, and ultimately to render pecuniary assistance to such travelers and explorers as may require it, in order to facilitate the attainment of some particular object of research. Lectures are given monthly or as occasion offers, by native or foreign travelers or qualified scientists. Conversazionis are also held at stated periods.

Dues for associate members, five dollars per year. Initiation fee for fellows, (F. G. S. C.) ten dollars; monthly dues, one dollar; life membership, one hundred dollars. There are sixty-seven life members, and fifteen honorary members. Total membership over four hundred.

President, Frederick Wm. D'Evelyn, M. B. C. M., Edin.; Secretary, P. MacEwen, Academy of Sciences Building, San Francisco, California.

THE SIERRA CLUB

The Sierra Club was organized at San Francisco in 1892. "The purposes of the club as set forth in the Articles of Incorporation are: To explore, enjoy and render accessible the mountain regions of the Pacific Coast; to publish authentic information concerning them; to enlist the support and co-öperation of the people and the government in preserving the forests and other natural features of the Sierra Nevada Mountains.

Its members have scaled almost inaccessible peaks of the Sierra, explored unknown regions, and brought to the attention of the public the beauty and grandeur of the mountains of California. But its most important work thus far has been in advocating and securing the establishment of forest reservations in California, whereby great tracts of forests have been preserved from destruction."

The club conducts annual outings, and it is planned to increase the number to several each year. Regular meetings are held, open to the public; papers are read and discussed. A regular semi-annual bulletin is issued free to members, and various special bulletins have also been published. There is no admission fee, and the annual dues are but three dollars. There are about five hundred members, mostly in California, though nearly all countries are represented.

Professor John Muir is President; Secretary, Mr. Wm. E. Colby, Mills Building, San Francisco.

THE PHILADELPHIA GEOGRAPHIC SOCIETY

The Philadelphia Geographic Society was organized in 1893 as The Geographical Club, its title being changed to the present form four years later. The purpose of the society is the advancement of exploration and of the science of geography, the recording of discoveries, the presentation of the results of research, and the accumulation of works on geography. Regular meetings are held monthly from November to May inclusive, with occasional special meetings during the same period. Inter-monthly meetings at which the addresses and discussions are more informal in character have been successfully conducted.

Besides various trips for exploration and discovery made by members, the society has been associated with larger expeditions, such as the Peary Arctic expedition of 1893, and with several of the Peary auxiliary expeditions. Under the guidance of the excursion committee, places of interest in the vicinity of Philadelphia are visited during the spring and autumn. The society has established a gold medal in honor of the famous Philadelphia explorer, Elisha Kent Kane, M. D. This medal has been awarded to Dr. A. Donaldson Smith and to Commander Robert E. Peary. A prize is also offered to the classes in geography in the University of Pennsylvania for the best thesis on a geographic subject.

The *Bulletin*, published at irregular intervals, contains contributions of much interest and value. There are over four hundred and fifty active members, and thirty honorary and corresponding members. Annual dues for active members, five dollars; for corresponding members, two dollars and fifty cents. The President is Professor Angelo Heilprin; Recording Secretary, Mr. F. B. Greene; Corresponding Secretary, Dr. Paul J. Sartain. The society has rooms at 1510 Chestnut Street, Philadelphia.

THE GEOGRAPHIC SOCIETY OF CHICAGO

The Geographic Society of Chicago was organized in 1898 with the purpose of diffusing geographic knowledge, and for the betterment of the teaching of geography; to establish in the center of Chicago a room to serve as a meeting place for the members, and a reference room of the latest maps, charts and books on geographic subjects; to accumulate collections of lantern slides, illustrative of geographic subjects, to be loaned for use in schools; to establish traveling museum collections used in the same way by schools. Occasional bulletins are published bearing on local geography. A course of about eight lectures is given each winter season, treating geographic subjects from various points of view, botanical, zoölogical, ethnological, philosophical, historical and descriptive.

Each spring several field excursions are made to points of local interest.

The annual dues are two dollars. There are about one hundred and fifty members. The President is Professor Zonia Baber; Secretary, Miss Louella Chapin, 5418 Kimbark Avenue, Chicago.

THE ALASKA GEOGRAPHICAL SOCIETY

The Alaska Geographical Society was organized in 1898 at Seattle, Washington, "to encourage geographical exploration and discovery; to

disseminate geographical information by discussion, lectures and publications; to foster commerce and navigation; to promote the great industrial, educational and material interests of Alaska and the islands and countries of the Pacific; to make collections of the best maps, charts, and photographs and books on geography, and to carry on correspondence with societies and individuals whose work is connected with geography."

The society has participated in three international expositions, with large exhibits. Membership, twelve hundred. No entrance fee. Annual dues, two dollars. Life fellowship, one hundred dollars. President, Arthur C. Jackson, F. R. G. S.; Secretary, Harrington Emerson, Seattle, Washington.

THE GEOGRAPHICAL SOCIETY OF BALTIMORE

The Geographical Society of Baltimore was organized October 17, 1902, with the aim of "the promotion and diffusion of geographical knowledge, more particularly of that which is of commercial importance to Baltimore," and also to aid and prosecute geographical research. An expedition is now organized to spend two months in research in the Bahama Islands, leaving Baltimore about the first week in June. A course of six lectures was given the current season.

There is but one class of members, and the enrolment has already reached the total of seventeen hundred and twenty-five. The annual dues are one dollar.

President, Dr. Daniel C. Gilman; Secretary, Dr. George B. Shattuck, Biological Laboratory, Johns Hopkins University.

THE HARVARD TRAVELERS' CLUB.

The Harvard Travelers' Club has been formed during the current season, "to promote intelligent travel and exploration, especially by Harvard men." There is an initiation fee of five dollars, and for the present there are no annual dues. A provision is made for the grade of Fellow, for members who have traveled extensively or who have undertaken original exploration.

Six meetings were provided for the current season, with lectures by Commander R. E. Peary, Professor I. C. Russell and others. A list of members will be issued in May. The Secretary is Mr. J. C. Phillips, 299 Berkeley Street, Boston.

TIME*

BY FOREST R. MOULTON,
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INTERRELATIONS OF THE SCIENCES

THE evolution of the method of scientific inquiry has long been in the direction of specialization. The many new fields which have been opened up, as well as the remarkable advances which have been made in those which have longer been the subjects of investigation, have made these changes necessary. It has become practically impossible for a single individual to obtain such a general knowledge of different sciences which are not most intimately related, and at the same time such a command of necessary details and such expertness in technique that he can hope to make important contributions to them. This condition of affairs has developed a class of specialists whose achievements are justifying their methods.

There is, however, another sort of work, frequently of the highest importance, which consists in coördinating the results obtained in special fields. Indeed, as a general rule the importance of a fact is directly proportional to the number of its essential relations with other facts. Thus, the Newtonian law of gravitation and the law of the conservation of energy have played rôles of unparalleled importance in modern scientific discoveries because of their universal relations to physical phenomena. Therefore from a purely scientific point of view work in correlating facts may be of as much importance as any.

Likewise, in considering education from the utilitarian point of view, it is at once apparent that a knowledge of facts is of no greater importance than a just appreciation of their relationships. The ability to anticipate events, which is of so much importance in business and public life, consists to a very large extent in being able to draw conclusions from data which are available to all. Or, simpler still, ordinary common sense, which is one of the most valuable possessions one can have, doubtless consists largely in a just estimation of the relative importance of things.

It appears, therefore, that coördination is a valuable part of scientific work, and also that the average person should not only know facts

*This is the first of a series of articles on Mathematical Geography to be written by Professor Moulton, for the especial use of teachers in Elementary Schools.—*Editor.*

but should thoroughly understand their relations as well. Everyone knows that the most valuable and lasting things he ever obtained from any teacher were not the few facts he may have been taught, but that they were the judicial attitude of mind and the intellectual balance which characterize good thinkers. It follows from these considerations that the average teacher, while being proficient in the subjects he teaches, should have a good knowledge of related subjects; that he should realize that the divisions of science are more or less artificial and for convenience; that, to obtain the best results in one subject, the points of contact with related subjects should be shown; and, above all, that the primary object is to develop the faculties of the student rather than to teach any subject. In accordance with these ideas this paper, as well as those which may follow, will be devoted to questions lying for the most part on the border lines between Astronomy on the one hand, and Geography and Geology on the other, and an attempt will be made in them to show some of the relations existing among these sciences.

TIME AND ITS MEASUREMENT

Formal definitions of what time is are frequently given, but they are usually mere combinations of words which mean nothing to the reader if he has not already a satisfactory idea of what is meant by the term. In fact, a little thought will convince one that it is not easy to define time in other terms, nor is it a simple matter to state what we know about it. It will not be profitable to enter into a discussion here respecting its existence in the abstract. It is sufficient to observe that if a number of events are under consideration the relations of their occurring are such that everyone can arrange them in the same unique order. That is, in the case of two events A and B, everyone can say that A existed when B did not exist and that when B existed A existed also; or, we have a definite idea of the order of their occurring, and so on for any number of events. The point to be noticed here is that there is universal agreement in the question of order, at least in cases which offer no observational difficulties.

It must not be inferred, however, that the question of order is all that is involved in time, for time is supposed to be measurable, while order is not. The difficult question relates to the intervals between events. We have a more or less vivid impression that there is an interval between two events, which is probably induced by the consciousness that a number of other events have occurred between them, such as something we can hear or see, or, perhaps, such physiological

processes as the number of heart beats or the number of mental acts. But this impression is not of the same certain character as the idea of order. If many persons observe two events A and B and then two others C and D, they will not in general agree among themselves as to the relation between the interval A B and the interval C D. The estimate of the interval in the two cases depends upon a multitude of things such as the comfort of the individual, and his physical and mental activity. Everyone remembers how a few days of travel, especially when he was young, amid unfamiliar surroundings, have seemed like ordinary weeks of time, and how he marveled on his return that he did not look as strange to his friends as they did to him. The multitude of new experiences gave the impression of great length of time. For similar reasons short dreams often seem to fill hours or even days of time. It is clear that such indefinite methods of estimating time as these are of very little scientific value.

It will be found that the estimates of various observers agree more nearly the more fully they base them upon counts of the occurrences of simple phenomena. It will be perceived at once that this implies that they have supposed that the simple events observed have occurred at equal intervals, or perhaps in rare cases in unequal but simply related intervals. This being the basis of our ideas of intervals of time, and the only way of measuring them, it remains to simplify the method and make it precise. To do this it is only necessary to select some event which is repeated an indefinite number of times in such a manner that it will occur after, in a sense of order, any event of another kind, and such that it can be universally observed.

It may be stated without further remarks that equal intervals of time are defined by Newton's first law, or axiom, of motion, which affirms that *a body subject to no forces moves uniformly in a straight line.* That is, two intervals are equal *by definition* if a moving body which is subject to no forces passes over equal distances in them. It is impossible practically to realize the condition stated in the law, but the indirect consequences of it are of great simplicity. It follows from this and the other laws of motion that the earth rotates uniformly. (The possible corrections to this statement are discussed in the next section.) Therefore the rotation of the earth becomes not only the practical measurer of time but as a result of Newton's laws, the definition of what is meant by equal intervals of time. If it were not a definition its correctness could be tested. But it is well known that if anything, such as a clock, disagrees with the rotation of the earth, it is at once assumed to be wrong. The only sensible method of testing it would

be to compare its rotation with some other simple consequence of Newton's laws, such as the rotation or revolution of some other planet. If there were a disagreement it would show that one or the other of the bodies is subject to effective exterior forces not taken into account.

It will be observed that this definition of duration, which is at the bottom of every method of measuring time, does not depend upon any particular conception of time in the abstract; indeed, if any such thing as time independent of physical phenomena exists, it is quite possible that this definition may disagree with it.

POSSIBLE CHANGES IN THE STANDARD OF TIME

As has been stated, time is practically measured by the rotation of the earth, while the definition of equal portions of it is contained in Newton's first law of motion. If the forces to which the earth is subject cause it to rotate non-uniformly on the basis of the Newtonian laws, then the practical standard of time will be variable with respect to that basis. Are there forces at work upon the earth (the Newtonian law will henceforth always be assumed to give the standard) which change its rate of rotation?

The earth is rotating in the luminiferous ether and a considerable quantity of meteoric matter. The latter, if not the former, offers some resistance to its motion, and causes it to rotate more slowly, just as friction causes the rotation of a top to die out. But this resistance is exceedingly feeble and will produce no measurable results for thousands of years. It would produce sensible results in the motion of the earth much more quickly, but even there the effects are inappreciable.

As the earth loses its interior heat it undoubtedly shrinks a little. The effect of this change in size is to make it rotate faster, but the increase of motion is exceedingly slight.

The sun and moon generate tides in the earth which move around in the westward direction. Since the earth rotates eastward the impact of these tidal waves on the shores and the friction they encounter in passing along the oceans retard the rotation of the earth. These effects are again very small.

Changes in the form of the earth such as the elevation and subsidence of continents, or the less important alterations produced by erosion, or the evaporation of quantities of water and subsequent condensation in another latitude produce slight changes in the rotation of the earth. In fact, if any mass is moved so that its distance from the axis of the earth is changed, and no compensating shifting is made, the rate of rotation of the earth will be altered.

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The important question is whether these changes are sensible. Those due to the causes last mentioned are not only exceedingly minute but they nearly, if not exactly, balance each other. Those due to the first and third causes are constantly in the same direction while that due to the second cause continually opposes them. It is very difficult to determine their precise effects quantitatively, but they are certainly so minute that they do not change the length of the day by a second in ten thousand years. Therefore, if one be divided by the number of days in ten thousand years a number will be obtained which will be greater than the difference between any two successive days when it is expressed in seconds. It is evident that this is an interval so small that it is absolutely inappreciable; hence the rotation of the earth may be taken as giving the same results within the limits of observation as Newton's first law of motion.

One difficulty remains to be mentioned which might be easily overlooked. It has been tacitly assumed that it is possible to determine when the earth has completed a rotation, but this is clearly impossible unless a fixed direction in space, not parallel to the earth's axis, is known. Now there are no known fixed points or lines in space by means of which a fixed direction can be determined, but it is *assumed* that the stars do not, on the average, move in any angular direction with respect to the earth. Hence it is necessary to admit the assumption, which of course appears most reasonable, in order to make use of the rotation of the earth as a means of measuring time.

It should be remarked that if one should attempt to apply the definition contained in Newton's law a corresponding difficulty would be encountered. In this case it would be necessary to determine in some way a fixed point in space from which to measure the distances, a difficulty which is less easily overcome by any reasonable and practicable assumption.

SIDEREAL TIME AND SOLAR TIME

Sidereal time is measured by the rotation of the earth with respect to the stars, and solar time by the rotation of the earth with respect to the sun. Because of the earth's revolution around the sun, the sun appears, as seen from the earth, to move eastward among the stars, completing a revolution with respect to them in a year. Now suppose the sun and a star are on the meridian at a given time; after a certain interval the earth will have turned so that the star is again on the meridian. This interval constitutes the length of a sidereal day, all of which are almost exactly of the same length, as has been explained above.

But at the end of this interval the sun will have moved nearly a degree eastward and will therefore lack a little of being on the meridian. It takes nearly four sidereal minutes for the earth to turn enough more to bring it on the meridian. When it has arrived there a solar day has elapsed.

SHORTEST SOLAR DAYS AND LONGEST SOLAR DAYS

The earth moves faster when it is near the sun than when it is more distant; consequently the apparent motion of the sun among the stars is not uniform. Besides this the sun has a northward and southward motion, which at times decreases the eastward motion. Hence, for these two reasons, the apparent eastward motion of the sun among the stars, which alone makes the solar day longer than the sidereal, is irregular; and there is a corresponding variation in the lengths of the solar days. The lengths of the days vary in quite a complicated manner, though the extreme difference is not very large.

The longest day in the year is December 22d (it may vary by a day from this date because of the leap year once in four years) which is 4m. 26.5s longer than the sidereal day when the difference is expressed in sidereal time. Thus, the day which has the least time of sunlight for positions in our latitude, and which in ordinary speech is spoken of as the shortest day in the year, is actually the longest from the time the sun is on the meridian until the sun is on the meridian again. From December 22d the solar days constantly decrease in length until March 26th, when they are only 3m. 38s. longer than a sidereal day. From March 26th the solar days increase in length until June 20th, when they are 4m. 9.5s. longer than the sidereal day. From June 20th the solar days again decrease in length until September 17th, which is the shortest day in the whole year, being only 3m. 35.2s. longer than the sidereal day. The difference in length between the longest day and the shortest day is therefore about 51.3s. of sidereal time. From September 17th until December 22d the solar days constantly increase in length.

The average length of the solar days, which is 24h. 3m. 56.556s. in sidereal time, is called the mean solar day. This is the time in actual use, being divided into twenty-four mean solar hours, and from this point on all references to time will be to mean solar time. Mean solar days are all of the same length, with the same approximation that sidereal days are of the same length, and ordinary time-pieces are made to keep this time as nearly as possible. It would be very difficult, if not impossible, to construct a clock which would keep true solar time with any high degree of accuracy.

LOCAL TIME AND STANDARD TIME

The mean solar time of a place is called its local time. All places having the same longitude have the same local time, but places having different longitudes have different local times. In going around the earth, a distance of about 25,000 miles, the difference is twenty-four hours; consequently at the earth's equator, seventeen miles in longitude correspond to about one minute in time. In our latitude the circumference of the earth along a parallel of latitude is considerably less, and

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Standard Time Belts in the United States

twelve miles correspond to about one minute in time. Hence the difference in local time between places on the Atlantic coast and those on the Pacific coast, which are separated by nearly 3,000 miles, is about four hours.

In order to avoid the endless confusion, and in some cases danger, that would follow if places comparatively near together should have sensibly different time, it has become quite customary for all places which do not differ more than about half an hour in local time from that of some convenient meridian to use the local time of that meridian. Thus, while the extreme difference in local time of places using the same time is about an hour, the error in either of them is only half an

hour. In this manner a strip of country about 720 miles wide east and west uses the same time, and the next strip of the same width an hour different, and so on. This time is called *standard time*, and it differs from the local time except in one meridian in each strip.

In the United States there are four hours of standard time used. The eastern portion uses Eastern Time which is the local time on the 75th meridian west from Greenwich, which runs through Philadelphia. At places east of this meridian it is later by local time than by standard time, the difference being about one minute for twelve miles. Thus, at New York, on the basis of local time, standard clocks are twelve minutes slow, at Boston twenty-four minutes slow, etc. At places west of this meridian, but in the eastern time division, standard clocks are correspondingly fast, the difference being nearly twelve minutes at Pittsburg. West of Buffalo, and a line running irregularly northward and southward through it, Central Time, which is the local time of the 90th meridian, is used. This meridian passes through St. Louis. Standard clocks of places east of this are slow, the difference being nearly half an hour at Cincinnati and about eight minutes at Chicago. The western limit of Central Time extends through the Dakotas and Texas. The next division westward is called Mountain Time, and is the local time of the 105th meridian, which passes through Denver. This division of time is used west as far as Ogden. The next is Pacific Time, the local time of the 120th meridian which is about 100 miles east of San Francisco. As the intervals between the standard meridians are in all cases 15 degrees of longitude, which equals one hour of time, there is a difference of one hour between one division of time and the next. If the exact divisions were used the boundaries between one time division and the next would be meridians 7.5 degrees east and west of the standard meridians. As a matter of fact the railroads, which furnish local time to most places, and to which most people look for correct time, use dividing points between the divisions of time according to their own convenience. It obviously would be unwise to have railroad time change during the run of a given engineer. Hence railroad time changes at the most convenient place near the boundary of the time division, that is, at the nearest point where engineers change. As a result, the boundaries of the several time divisions as used are very irregular, and vary in many cases very strikingly from the standard divisions. (See map page 357.)

Although this very convenient system was adopted in 1883 and is in universal use by railroads, yet many people, and even schools, persist in creating confusion by using local time. In some cities one has

to allow a margin of twenty minutes in appointments because of the uncertainties due to this chaotic state. It is perfectly clear that standard time is in every respect just as good as any and that it has the immense advantage of being uniform over large sections of country. Let educated people, who above all others should consciously direct their activities in the direction of reforms, not hinder advances inaugurated by commercial interests; instead of being paralyzed with conservatism let them become the leaders of progress.

DISTRIBUTION OF TIME

The accurate practical determination of time and its distribution are problems of much importance. There are several methods of determining time, but the one in common use is to observe the transits of stars across the meridian, which gives the sidereal time, and then, from the mathematical theory of the motion of the sun, to compute the mean solar time. It might be supposed that it would be simpler to observe the transit of the sun, but it is not so. In the first place it is much more difficult to determine the exact time of the transit of the sun's center than it is the time of the transit of a star, and it occurs but once in twenty-four hours while many stars may be observed; in the second place, it gives true solar time instead of mean solar time, and its correction is as difficult as that required in the other method.

It remains now to explain how time is distributed from the observatories where the observations are made. The chief source of time for railroad and commercial purposes is the Naval Observatory at Georgetown Heights, Washington, D. C. There are three clocks keeping standard time at this observatory. At night the errors of the three clocks are found from observation, and, after applying this correction, the mean of the three is taken as giving the true standard time for the succeeding twenty-four hours. At five minutes before noon eastern time the Western Union Telegraph Company suspends its ordinary business and throws its lines into electrical connection with the standard clock at the Naval Observatory. An arrangement is made so that the sounding key makes a stroke every second during these five minutes except the twenty-ninth second of each minute, the last five seconds of the first four minutes, and the last ten seconds of the fifth minute. This gives the opportunity to make ten determinations of the error of a clock at any point. To simplify matters clocks are made which are automatically regulated by these signals, and there are at present more than 30,000 of them in use in this country.

These noon signals also operate time balls in fifteen ports in the

United States. This device consists of a large ball being dropped at noon, eastern time, by means of electrical connection with the Naval observatory, from a considerable height, at conspicuous points.

The time signals are sent out from the Naval Observatory with an error usually less than two-tenths of a second, but this is frequently considerably increased by the system of relays which must be used to reach great distances. Probably the greatest source of error, except in the case of those automatically regulated, is in setting the clocks by the signals.

The time service just described reaches directly nearly all parts of the country east of Ogden. West of Ogden time is distributed in the same manner from the Mare Island Navy Yard, California. Besides the government sources, the Allegheny Observatory furnishes time to the Pennsylvania railroad; the Goodsell Observatory, of Northfield, Minn., to the Great Northern, the Northern Pacific, the Great Western and the "Soo" lines; the Lick Observatory, to the Southern Pacific system. Many other observatories furnish time for local purposes, and practically every one keeps its own time.

GEOGRAPHICAL TEXT-BOOKS AND GEOGRAPHICAL TEACHING*

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GEOGRAPHY IN SECONDARY SCHOOLS

IN reserving the "advanced" geography, that of the secondary schools of the adolescent age, for the end of the discussion, I suppose I have been prompted by the natural instincts which lead us to put off as long as we can that part of the work which appears most thorny. For while the majority of geographers agree on the main points concerning the two extreme stages, this middle stage is found in our day in a kind of nebulous condition which, with all due respect, can be called nothing but chaotic. Of course, the whole of the present floating and uncertain tendencies of High School teaching, hustled hither and thither between conflicting demands of classical, scientific, and business interests, has its direct bearing also on

*Continued from THE JOURNAL OF GEOGRAPHY, Vol. II., p. 243.

The editor desires to correct a misprint that occurred on page 229 of Mrs. Genthe's article in the May issue of the JOURNAL. Instead of:

"In scientific training, knowledge for knowledge's sake may mean, if not everything, at least very nearly everything, in training children. Knowledge is valuable mainly in proportion as its acquisition means, to the child, so many more steps toward the possession of the power to discern between the false and the true . . . ," the passage ought to read:

"In scientific training, knowledge for knowledge's sake may mean, if not everything, at least very nearly everything; in training children, knowledge is valuable mainly in proportion as its acquisition means. . . . ."—*Editor.*

the course in geography, and neither the text-book nor the teachers can be held entirely responsible for it. But since we stand, to be sure, on the eve of important innovations in the high school curriculum, it may not be untimely to consider what secondary geography really ought to be in order to get more definite ideas about that which, at present, can be characterized only as being no longer elementary and not yet scientific.

Like Janus, advanced geography looks backward and forward at the same time. The student is "advanced" beyond that stage where he needs the constant supervision and guidance of the teacher; he has learned how to walk alone for some distance; but he has yet to acquire that mature independence of thought which is founded on an all-sided knowledge of the subject and a preliminary one of scientific methods, a knowledge which he will need in the scientific pursuit of the subject as well as for its practical application in life. Building upon the beginnings made in the elementary school, the work of this stage is to furnish him this equipment. Without keeping in mind constantly this transitory character of secondary geography, no discussion of the subject will ever lead to helpful results, and it seems to me, that in the laying out of the present courses, as they appear in the current text-books, this side of the subject has received too little consideration. Or how could it be possible, if it were otherwise, that the same book may be used in colleges as well as in high schools, nay, that a student who has taken a course in physical geography at the high school may get credit for this course at the college toward his degree? If the instruction given at high schools and colleges is the same, why, then, have we high schools? Why colleges? What is the use of going to college if people can study the same thing at the high school, and vice versa? We find ourselves face to face here with a confusion of the scopes of the work of these two institutions that is of most fatal consequence. But where is the mistake being made? Does the high school trespass upon the college ground, or does the college fall back from the standard which it ought to maintain?

My impression is that the former is the case. What is offered under the name of physical geography at the high schools, and what is required by the College Entrance Examination Board, *is not advanced, but practically mature geography;* the text-books are, not texts for advanced teaching, but condensed outlines of courses for scientific teaching, and the geographer who is also a teacher and who realizes the abilities of students of high school age and elementary preparation, stands terrified, asking himself how in the world all this matter shall

be stuffed into a half grown up boy's or girl's head in the course of one single year! Yet, in spite of all this overcrowding, the course is one-sided. Or is physical geography the only side of this vast subject? Professor Dodge states that the leading teachers and the foremost texts in current use agree that "there should be no endeavor to present a complete course in any one of the several elementary subjects that contribute naturally to the work in physical geography,"* and that "Meteorology, Oceanography, Geomorphology, and Anthropogeography, as such, should be left for the colleges"* (or perhaps in some cases be given as electives in the advanced years of High School). But, if the High School is to prepare the student for college, and if the complete list of the subjects is recognized as belonging to the college curriculum, does the high school fulfill its duty as long as *it gives the "training in scientific thinking"† in physiography only* and allows the student to enter college with no other but elementary preparation in the other branches? Such words may sound heretical at the present time when an all-important Board of Examiners has laid out an official course intended to present the only way to salvation for the high schools who wish to see their course in geography recognized as satisfactory; but most of the truths which later on become truisms first appeared as heresies. It may be true, for the present and the most immediate future, as long as teachers with an adequate scientific and professional education can be had only for physical geography that a good course in this is better than a bad one in complete geography; but this must not make us blind to the real needs of the course. If I imagine a time when every teacher of geography at a secondary school will have a well rounded geographical training, I feel sure that the time will then also come when physical geography will no longer monopolize the geographic studies in the secondary school. For *High School and College Geography are not identical*, and all the courses, all the text-books for use in the high school can be really effective only when they are planned as distinctly different from scientific as they are from elementary geography.

Let us remember that at the completion of the elementary work the student's geographic education comprises the following: elementary knowledge of complete geography (using "complete" as a collective for physical, political, commercial geography, the geography of plants, animals, and man, Climatology, Oceanography, etc., such as they afterwards branch off to form different departments) together with the power

*Geography in the Horace Mann Schools. Teachers' College Record, March, 1901, p. 75.

† Geography in the Horace Mann Schools, *loc. cit.*, p. 75.

of observation and reproduction, and, inasmuch as can be expected of him at this age, of collecting information from printed sources. If, at the end of the secondary course, he is to be well equipped for scientific pursuits or for life's practical duties, to this must be added a broader and deeper knowledge of geographic facts seen in the light of geographic laws and processes, and such an increase in his power for observation and study in "scientific thinking," that will make him a practically independent of the directions of the teacher. * But this "broader and deeper conception" of the subject *is not necessarily systematic*. This is where the mistake has been made. We have come to a stage in the development of geography in this country where all that is not systematic, all that does not place before the student a more or less abstract framework of ideas and definitions, is decried as old, dull, worthless stuff which has no right to exist in a secondary course. It is the old mistake of neglecting the importance of the difference between scientific and pedagogic treatment of the same subject. This must not be misunderstood: I am far from proclaiming an incompatibility of pedagogy and science; but while all that is taught at the schools must be in accordance with the results of science, all the results of science cannot be taught at the schools; and what is more important: even the smallest selection from the results of science cannot be presented in the schools in the same way in which it would be presented in the scientific institutions. Scientific teaching is abstraction, and the concrete part of the work serves only as an illustration; pedagogic treatment must be concrete, and use the abstract part of the work only as an aid to intelligent study. As a well known school principal said to me some time ago: "Mr. Soandso (he named one of our leading geographers) may know ten times more of geography than I do; but when it comes to teaching geography at my school, I do not hesitate to say that I know this ever so much better than Mr. Soandso, and that if I should engage him for grade work at the school, he would fail." This is the kind of feeling I wish every secondary teacher would have on the subject, and every author of a text-book for these schools ought to remember this. For both are speaking, not to the geographic scientist, but to a mind that has still to receive its "training in scientific thinking." The common fault of our text-books, however excellent some of them appear from the technical point of view, lies there. They have been written more from the point of view of the

*Inasmuch as the larger proportion of children do not receive any school training beyond the elementary school, it would seem wise not to postpone all training which will give "independence" of thought until the high school.—*Editor.*

scientist than from that of the secondary teacher and student. However beautifully illustrated, and however rich in "practical exercises," their contents are beyond the abilities of the average boy or girl of from 13 to 16, because the difference between their previous training, purely elementary in subject and method, and the present, essentially scientific *in both*, is too great.

This difficulty might be avoided, and the course, at the same time, made more complete than at present if, instead of being based on the physiographic system, it were planned as an advanced treatment, a treatment from the scientific point of view, of the more important countries of the earth, which below the High School have been known to the student only in an elementary way. Such a course would present the physiographical or political divisions of the earth as geographic individuals or units in all their physiographic, climatologic, bio- and anthropogeographic, etc. conditions, demonstrating how these factors influence the individual part of the earth and each other, and thus, without aiming at the completion of anything like a systematically complete treatment of these sciences, it would gradually lead the student to an understanding and appreciation of all of their laws and processes as far as they have a bearing on the problems of earth and life that confront the student, which would be immensely helpful to the later scientific study of all of these subjects. It would be, as it were, not a treatment of physiographic laws as exemplified in the conditions of the various parts of the earth, but a treatment of these conditions that leads up to the recognition of the laws underlying them and governing them. Thus introducing *new lines of thought* by means of *a subject already familiar* to the student in its information parts, we obtain a transition from the elementary to the scientific treatment that takes away much of the difficulty from the novice because, while a new way of thinking is required of him, he feels himself on familiar grounds as far at least as the subject matter is concerned. We also enable him, by a comparison between the former and the present treatment, while the character of the subject remains unchanged, to realize the difference of elementary and scientific methods more fully than he could if, the subject also being new to him, he had no unit of comparison. At the same time, the advanced discussion of the subject will add to his positive information and, with a supply of intelligent information about subjects formerly known but vaguely to him, give him a treasure of knowledge too often badly lacking among college students. This will contribute greatly to his success in the scientific study of later years, because he will *know* enough of the subject so that the abstractions of

the science are more than mere words to him. I have heard college professors complain again and again that the students, when they should begin the mature treatment of the subject, and see the great ideas that constitute the scientific point of view, are quite unable to grasp the real connections because their preparatory training has not equipped them with enough positive information on the subject; that when the scientific teacher wants to illustrate a law or a process by an example, this is not an illustration to them, but new information; that the generalizations of science are empty phrases to them because they do not awaken in their minds the associations which give life to the abstraction; that the only thing they can do as faithful students is to learn by heart, as they would Latin vocables, the examples that should have become their mental property long ago!

This is all the fault of the wrong attitude toward the work taken by the secondary text-books. They want to combine in one course that which, as long as the human mind is what it is at present, can never be done simultaneously: they want to furnish advanced information and to teach the system at the same time. They must fail in both: in the first, because the facts of geographic information, torn from their local connections, stand isolated and cannot produce a vivid picture in the minds of the students; in the second, because the information that should be the *basis* of the system being filled in patchwise between its divisions, the system stands, as it were, in the air. Thus we obtain that erroneous conception of geography in which our beautiful science appears only as a framework of topics for which the bulk of geography has no other value but that of a collection of samples,—the same mistake that was made in the older teaching of the languages, when the language itself was treated as nothing but a collection of examples for the application of grammatical rules,—and in spite of all the "new" geography the courses appear at times to fall apart into just the same aggregation of "unconnected items" as was the old sailor geography.

This error of recognizing no "advanced" treatment unless it follow scrupulously the lines of the scientific system is pardonable in a science so young as geography is in this country; but for this it ought not to be allowed to last much longer. For it serves to create a contempt of the informational part of geography as unscientific and unworthy of advanced treatment whose influence must be fatal to the whole development of geographic teaching in this country. It is not the information that makes the study inferior, but the way in which it is imparted. If the teacher does not know how to bring to the foreground

the higher aspects of the subject, all his teaching will remain purely "informational" in the bad meaning of the term, whatever excellent "Physical Geography" he may use; nothing will, on the other hand, assist the conception of the scientific aspects of the subject better than a solid stock of intelligently acquired information on the subject. Let us not deceive ourselves. We cannot revert nature. In the beginning was the information. First man had to see, to know, what was there before he could classify what he saw; the very idea of classification requires the pre-existence of ample information because, without a variety of things that he knew, man would never have stopped to compare and to put together similar things. I am firmly convinced that a student who has been trained at the High School as indicated above will be better prepared for the work of the college than if his secondary course had allowed him to flatter himself that he was already doing "scientific" geography, and to come to the college saying: "No more of this, I have had it all, it is all old trash to me"—while practically he would not know more than a grammar school child knows. But if, on leaving the High School, he should enter the much more difficult school of life, he will still be better equipped for its requirements by the possession of a many-sided, well founded information about the world, its products, and its inhabitants, than by being able to define the difference between consequent and subsequent streams.

But we are altogether too impatient. We cannot wait, and our pupils cannot wait, until the maturity for scientific work is reached, before beginning with it. We would, if we could, teach science to the pupils of the elementary school, and in return we have to go over the primer again with our college students. Our school work is so contaminated by the hurry and hustle of business life, that every stage trespasses on the next higher one, and all three suffer from it. For each of the three stages has its special mission in education, from which it cannot deviate without jeopardizing the interests of the other. The elementary school, is supplying the first information, training observation, stimulating the interest in the studies, awakening and developing the dormant powers of gathering information, but in the theoretical part of the work it has no other share but to awaken a feeling of the laws that govern the things without any attempt of a definition, in the same way as it has to develop in the mind of the child a feeling for what is right or wrong long before the laws of ethics can be discussed with him. A clearer perception of the laws and definitions, though still without attempting the erection of a complete system of the same, is the task of the High School. The information given there must be so wide, the presentation so logically

conclusive, that the necessity for the establishing of the law forces itself spontaneously on the mind of the student, that he anticipates, before they have been formulated, the generalizations resulting from his studies and observations. Here the ability for gathering information, prepared by the elementary work, the "training in scientific thinking," is used and developed to its full extent; here also, if anywhere, the notebook may have a place.

Even here, however, I venture to doubt its necessity, when comparing the time and energy spent on this work with the actual benefit it gives. On this stage the student has a regular text-book. This book ought to be, not a help for the teacher to lighten the burden of the classroom, but a guide for the student into the subject, namely, a compendium of the informational part of the work, of directions for laboratory and field study, of reference reading, of review questions, in one word, a complete *vade mecum* for the subject adapted to the needs of the advanced student. If the student has been trained in the right way, he will, even without the compulsion of the notebook requirement, never study problems of any difficulty without pen in hand, nor believe that he has mastered a chapter before he can write a short digest of the subject and construct the sketches and diagrams that go with it; but such work, if it really expresses his struggle with the subject, will seldom have the outward appearance of a paper to be handed in for an examination, and the requirement of fixing work of such eminently temporary value in a presentable shape appears criminal in view of the countless demands on the leisure of the student at an age where change between study and recreation is most necessary to him.

I do not undervalue the importance of written expression of thought. I know that half a page of written work is worth a whole page of reading. But is there no other means, not a more fruitful one, than the inevitable notebook? My personal opinion is that, if the teacher wants to ascertain how far the students have got possession of the subject, a few themes on questions of comparative geography, which require a rearrangement and re-presentation of the subject in a new order and from new points of view, will do them much more good, and will offer a far better gauge of their abilities, than the routine work of the notebook, which only suggests the delusion that they "produce" or even "discover" while they are but reproducing. Would not a collection of such themes, testified by the teacher's signature as the student's own work, form just as good a requirement for a college entrance examination as the highly praised notebook? It is not the skill in reproducing a prescribed topic which the college student, as well as the beginner in

business life, needs most of all in order to be successful—this comes of itself as soon as the subject is sufficiently mastered—but the power of looking at the things in a way different from that of daily practice, of getting at the hidden connections of things and conditions, of divining the unity in the multitude, in which the Riddle of the Universe unveils itself. Some time ago, at a renowned State University, a question was given at an examination which required such a comparative treatment of the subject of the course. After the examination, one of the students, who had failed, came up to the instructor, complaining that it was not his fault, because the answer to this question was not to be found in the text-books! Had the secondary school done its duty in this case?

I will mention only one more point. It seems to me that much might be gained for the quality of the work if the course extended over a longer part of the High School work. The present arrangement, under which a student enters on the subject, with no other than elementary preparation, and is expected to assimilate the whole thing in one year's course with daily practice on the subject, impresses me as if a man preferred to eat all the three meals of the day in a condensed form for breakfast. As the course stands now, it unquestionably pays too little attention to the digestive abilities of the human brain. Digestion will take its time, mentally and physically. Two years of the subject, with only two periods in the week, would not tax the time of the student any heavier than four periods through one year, yet they would represent an enormous relief as far as the mental strain on the student is concerned. If the same were applied to the other courses as well, there might also be gained by this a better correlation and interdependence of the courses in the sciences related to geography, which would greatly increase the educational value of the High School course.

The public High School is, at present, arrived at a crisis in its development; new claims are to be satisfied, and much that has hitherto been a cherished tradition will have to be abandoned. It is to be expected that in the course of this reform the true function of the High School in our public school system will be defined more clearly than it has been done at times, and that by the very observation of its limitations, by avoiding undue trespassing on grounds that are not its own, the course will be rendered stronger and more valuable than it has ever been before. Geography will then be allowed a more important place in secondary teaching, and it is the sacred duty of all concerned to find out what will be the best outline for the course that is going to supplant the old one. It is in this spirit that the above suggestions have been made; it is in this spirit that they wish to be received.

XUM

CULTIVATION OF RICE IN THE UNITED STATES*

BY LESLIE HARRISON

IT can be stated that rice cannot be grown without irrigation, and for all practical purposes that statement will hold true; for while it is true that "Providence" rice has been grown in the past, and is grown yet, it is also true that rice grown without the artificial application of water has comparatively small commercial value in the rice industry of the Southern States.

The methods of cultivation and irrigation are widely different in the two great rice districts of the country; for excepting the fact that the resultant crop is the same, and that both are grown by means of irrigation, there are few points of likeness. For example, Carolina rice-growing is historically the oldest in the country, and its present methods show almost the same primitive conditions which have characterized rice cultivation from its first Asiatic beginnings. Louisiana and Texas, on the other hand, whose industry has more than taken the place that was once occupied by South Carolina and Georgia, make use of the most improved methods, with expensive modern machinery for harvesting and threshing, and are now engaged in irrigation works of great magnitude.

Rice growing is not by any means a new venture in this country. In 1694 a storm-tossed Spanish vessel put into Charleston harbor, where it lay for some time to undergo necessary repairs. During this stay the captain of the vessel gave to one of the citizens of the town a handful of rough rice. From this one handful, through careful seeding and cultivation, developed the notable Carolina rice, now world-famous. For a long time Georgia and the Carolinas furnished the principal part of the rice crop of the country, and for a number of years preceding the civil war these states produced 105,000,000 pounds of cleaned rice annually. At the present time the annual yield is about 50,000,000 pounds.

Louisiana now produces more than half of the rice raised in this country, the annual output amounting to some 200,000,000 pounds. The history of her rice industry dates back to the exiled Acadians—French settlers from Nova Scotia—who in the last half of the eighteenth century began the raising of "Providence" rice; but providential rain was not to be depended on, and fat years were invariably followed by lean ones, so that irrigation came to be more and more desirable, until now

*Reprinted by permission from *Forestry and Irrigation*, July, 1903.

the systems of Louisiana are among the most elaborate and valuable in the country.

IRRIGATION OF RICE IN THE CAROLINAS AND GEORGIA

The rice industry of the Atlantic coast is confined to tidewater areas from Cape Fear to the Florida boundary of Georgia. In this area there are about 80,000 acres on which rice might be grown, but, as a matter of fact, only about half of this is cultivated. The water supply is entirely from coastal rivers, and the plantations must lie far enough above salt water to avoid its bad effects on the fields. This limits the cultiavtion to a strip lying not more than 30 miles from the coast, and seldom less than 15. In a few cases where the river water is brackish at certain seasons, storage reservoirs are provided to offset these conditions; and where the water is always too salt or the lands are above tidewater, the planter must depend on water taken from inland streams, lakes, or reservoirs.

Almost all the irrigation in the Carolinas and Georgia is of a simple nature. When reservoirs are required a small stream is dammed, so that the water backs up to form a reservoir, while the land below is irrigated by direct flow from the dam through suitable ditches or canals.

In the case of irrigation from tidewater, banks or levees are thrown up, and these are pierced by "trunks, or long boxes made of heavy timber and closed by a sort of gate at each end. These trunks are placed at an approximately mean distance between the limits of high and low tides, so that the water of high tide will flow through them onto the fields to be flooded, or so that the flood water may be turned off at the time of low tide. The gate at either end of the trunk is so arranged as to act as a valve, the pressure of the water against it serving to keep it shut unless it is held open by a lever provided for that purpose and worked from the top of the retaining bank or levee. Water flowing in at a time of high tide can be retained on the field for as long a time as is desirable, for when the tide drops, the water inside of the levee is held by the automatic closing of the inner gate. In the same manner, when it is desired to drain the field, the inner gate is held permanently open, while the outer one closes when the tide is up, thus preventing any inflow.

Drainage forms an essential part of rice culture, being absolutely necessary at the time of harvesting. Undertiling is of advantage in the Atlantic coastal fields only when the water is supplied from reservoirs or lakes. The rivers carry too much sediment during the freshet season to make a system of under-drainage successful, as the tiles

would soon become clogged; yet the slopes are for the most part fit for good drainage with but little grading. A system of low dikes and small ditches through the field accomplishes the desired results of equable application and depth of water, with rapid run-off when a draining of the field is desired.

Rice is a shallow feeder. Its mass of roots spreads out just below the surface, and none of them strike down to any great depth. On this account all plowing is shallow, generally not more than 3 or 4 inches deep, though a greater depth might be advantageous, as giving more plant food. In some places the ground is so stiff that it is flooded before plowing. Afterwards it is put in condition by disc harrow and roller.

On lands flooded by rivers which carry rich sediment, fertility is easily assured, but in many instances, and particularly in the growing of upland rice, fertilizer is needed, and this should be of a high grade to give best results, as cheap fertilizer is a false economy. Naturally the fertilizer varies in different localities; but cotton-seed meal, blood and bone, and other well known mixtures are used, most of them containing a good percentage of potash.

In planting great care must be exercised in the selection of the seed rice, in order that it may be free from the volunteer "red" rice and from weed seeds. Uniform kernels are also desirable, as a uniform crop will permit of a higher polish than kernels that vary. The seed is sown in March and April, and early sowing has many advantages, though some crops are put in as late as June, with varieties which mature quickly. The time of sowing also differs in different sections, and is affected by the weather and to some degree by the migrations of birds, which work havoc on the crop, either when planted or in the fall when the grain is in the "milk" stage. The grain is planted either by drills or in hoed trenches and dropped in by hand. The drilled method insures an even stand, which is a matter of some importance. It may be planted broadcast and harrowed in or it may be planted in hills. Some planters recommend the latter method, as it insures easy cultivation and a more effective campaign against weeds.

After planting, the next important step is flooding, and this is done soon after the seed is sown, sometimes on the same day. Seed that is not to be covered is clayed before planting by stirring it in clayed water, so that the flooding will not float it. Flooding serves several purposes. It protects the grain from the birds and causes quick germination. This water is left on the field several days, or until the seed is well sprouted. It is then drained off and no more water is applied until the plants are well up and the fields show considerable green.

Then a "stretch" flow is turned on for a few more days, until the plants are about six inches high, affording nourishment to the rice and impeding or destroying weed growths. When the plants have attained a sufficient growth under the stretch flow the water is gradually lowered to an average depth of a few inches, and remains on the field for a period of from two weeks to a month, the duration depending on local soil conditions. Then the dry growth follows for about a month and a half, and during this time the crop is cultivated with horse or hand hoes; weeds and volunteer rice are removed, and in some cases an intermediate flooding is made to protect the plants from grubs. When the plant begins to joint the harvest flow is turned on and this is kept almost touching the rice heads until their bending tells that the grain is ripe. The field is then drained for harvest.

The quantity of water required for irrigation is not looked into, but it is probable that here, as in many other places, the fault of over-irrigation is a common one. The supply from tidal streams is almost unlimited, and the whole question of water rights is never brought up, as there are none.

Harvesting machinery is not used, the grain being cut with hand hook or sickle. The beds in the field are narrow and usually small, to permit of complete drainage, and this would entail much breaking down of the grain and subsequent waste if a harvester were used. The grain is cut before it is dead ripe, or while the lower eighth of the head is still "in the milk," for if cutting is delayed until the head is quite ripe, there is much loss from the shelling out in handling. A high stubble is left, on which the grain cures for a day or two, when it is placed in shock after being put up in strawbound sheaves. As soon as possible, in order to avoid loss from storms, the grain is taken to the threshing-houses. These are permanent structures, one on each plantation, built on the bank of a stream or tidal canal, where tugs and lighters can get the rice to take it to market. The milling is a complicated process, for, after threshing, the rice or "paddy" still has two coverings—coarse outer husk and a thin close skin. These are taken off by special processes, and the different products—bran, flour, grain, and chaff—separated. In addition to this, the commercial article is always polished to give the grain the smooth, pearly appearance, which artificially enhances its market value, but detracts from the real food value.

IRRIGATION OF RICE IN LOUISIANA AND TEXAS

The rice of the Gulf States is now grown mainly on the uplands, and does not depend on tidal irrigation. With the use of modern methods

and machinery, the industry has developed into a leading one in these two states, while it has declined in the Carolinas and Georgia.

During the last fifty years, however, rice production in the United States has grown but little, and only the present time sees any great advance in production over the crop of 1850, for the decline in the Atlantic States has offset the advance in the Gulf States. It is possible that the former may adopt some of the methods in use in the latter, and thus regain the prestige held before the civil war, but until they do so they can not easily compete with improved machinery at home or cheap labor abroad. The production could and should be doubled, as we now produce less than half of the rice consumed in this country, and the use of rice as a staple article of food is constantly increasing.

Acadian success with "Providence" rice, intermittent as crops were, showed that, with proper methods of cultivation and irrigation, Louisiana was particularly fitted for this crop. At first, the only attempt at irrigation was the raising of levees above the rice fields to reserve some of the heavy rainfall, instead of allowing it to waste into the bayous. When water was needed to flood the fields, the levees were cut and the water allowed to flow on the plants; but in dry seasons this method of irrigation was worthless, and something more dependable had to be devised. Later it was discovered that upland soil was especially suited to the growing of rice, good crops being harvested in wet seasons, and it became only a matter of getting water to them when large areas could be cultivated and the industry could furnish a profitable commercial venture, worthy of the enlistment of capital.

The introduction of the steam-pump furnished the impetus which was needed. After some failures with pumps of wrong type or limited capacity, large centrifugal pumps were introduced to raise the water from bayous to canals. From these canals the water was pumped directly on the fields, and the problem was practically solved.

Yet there were a number of local conditions which made irrigation very different from what it was elsewhere. For example, it might be said that the only point of similarity between the Louisiana rice canal and the irrigation canal of the Western States is that both are filled with water for the purpose of irrigation. Beyond that the comparisons are contrasts, to use a Hibernianism. For instance, water flows in the western ditch and stands at a level in the rice canal; the source of supply in the West is above the field to be irrigated, and below it in Louisiana; the canal of the West is dug below the surface of the land through which it passes, while the rice canal is built up on the surface of the ground, and on the highest ground to be had; the western canal

holds water poorly, losing much through seepage through the soil, and the levees of the rice canal are impervious.

The proper construction of these levees, however, is of prime importance. The surface of the ground upon which the levees are to rest must be absolutely clear of all vegetation, and must then be plowed and pulverized, so that the earth embankment placed above will make a good "joint." To aid in this, deep furrows are plowed in the foundation earth, and the levee banks are built up firmly and of good material. This has to be done to prevent devastating breaks, as some of the canals are so large that they appear to be rivers of no inconsiderable size. Indeed, it is proposed to navigate some of them with lighters and barges for the transportation of "paddy" from the threshers to the mills which turn out the finished product. For examples of the great size of these canals, we have the Eagle Lake Rice Irrigation Canal, 17 miles long and 200 feet wide; the Trespalacios canal, 4½ miles long and 200 feet wide, and the Treadway canal, 25 miles long and 220 feet wide. Another canal, now under construction, will be 56 miles long and 175 feet wide.

Owing to the fact that these canals are practically on a level and have no current in many cases, they are subject to obstruction through the growth of water weeds, and these constitute a serious menace to the usefulness of the smaller ditches, unless the growths are removed.

All the water in these canals has to be pumped, and in most cases from bayous which are below the sea-level, onto lands which lie as high as 70 feet above. For such a raise it is necessary in most places to have several lifts, the first one being from the bayou or stream, and the others at intermediate points along the canal. The pumps are of two types only, both suction pumps, however—the centrifugal and rotary. The former is the more popular, as it does not need direct connection with the propelling machinery, being run by belt or rope transmission. The rotary pumps, when properly established, should be more efficient than the centrifugal, and as they are run much more slowly, there is less wear and tear; but the increased cost of installation, owing to the necessity for permanent and strong foundation, limits their use. Boilers and engines are of varied patterns, but any that are good will serve.

Fuel is of three kinds—coal, wood, and oil. Of these, coal is the most expensive and oil the cheapest and most convenient to handle. Wood can be had near at hand, as most of the bayous are in heavily wooded districts; but the cost of labor brings the price above that of fuel oil, which is delivered from the nearby Texas oil fields at a low rate. In Texas, where much of the irrigation is from artesian wells, crude oil is the important factor in the fuel and power question.

From the canals the water is distributed over the fields through measuring flumes, and is held at different levels in the sloping field by means of low levees, over which the water may flow until all the levels are flooded. Planters are now making these levees in the fields very flat and with gradual slopes, so that they interfere but little with the cultivable surface of the ground and allow the passage of the reaper and binder for harvesting. Since the water rises to the tops of these field levees, almost an average crop of rice is raised on them, and the fact that they can be cultivated and harvested makes it possible to keep out the weeds and red rice.

The application of water to the crop differs in some particulars from irrigation on the Atlantic coast. In the first place, the Louisiana farmers depend on early rains to start the crop, and need no flooding to protect the grain from birds, since the reed-bird or bobolink is not the pest in Louisiana and Texas that it is in the Carolinas and Georgia. The first growth of the crop, or until the plants are from six to ten inches high, is made without artificial application of water, but after that the fields are kept flooded until within ten days of harvest time, when the levees are cut, and the water drains off rapidly by means of ditches provided for that purpose, leaving the ground dry enough to permit the use of the reaper and binder. As the harvesting machinery is similar to that used elsewhere for wheat, so also is the threshing outfit. Mills are large and form an industry by themselves, not being in any way connected with the separate plantations, as in the Carolinas.

Several things will have to be done before the rice industry of Louisiana and Texas will be placed on as good a basis as that of the Atlantic seaboard in the matter of water supply. At present magnificent operations are going on, and great ventures are being pushed forward under state and national sanction. At present in many localities the bayou supplies are being overdrawn, so that many acres have had to be abandoned on account of lack of water, and in some instances brackish water has backed up from the sea because the bayou supplies have been so depleted. There seems to be no recognition of water rights on some of these supply streams and bayous, and as a consequence there are too many pumping plants on some, all of them being poorly supplied in dry seasons. In Texas, where artesian irrigation is used to a greater extent, the flow can be readily measured, the duty of water calculated, and only enough ground planted to be sufficiently irrigated; but development for the present threatens to be too rapid for present institutions to keep pace with it, and some radical departures will have to be made to secure all the water needed and to protect users in their rights.

XUM

GEOGRAPHICAL NOTES

The Trans-Andine Railway.—During the last session of the Chilean Congress, which closed in February, 1903, a bill was passed providing for the construction of a railway over the Andes Mountains, to connect Buenos Aires with Santiago and Valparaiso. This will be the first line to cross the continent of South America.

This railway was projected twenty years ago, and since that time some sort of measure dealing with the question has been before each session of Congress; but each in its turn failed to pass one or the other branch of the law-making body until on February 28 last, when the above-mentioned bill became a law.

A railway extending from Buenos Aires to the Cumbre of the Cordillera, at Uspallata Pass, to connect with the line from Valparaiso, is being constructed by the Argentine Government. Work on the new road is being pushed forward on both sides of the mountains, and prospects are bright for direct railway connections, within a few years, between the Atlantic and Pacific coasts, over the Andes, by a line extending through the heart of Chile and Argentina. This road will shorten the time between Europe and Chile by six or eight days, as traffic is now via the Strait of Magellan.

The railway from Buenos Aires is completed as far as Puente del Inca, a short distance from the Cumbre, and the line in course of construction in Chile is completed as far as Salto del Saldado, also near the pass over the Andes, and during the summer months—November to April—traffic is carried on over the mountains, along the route of the proposed railway, by mule caravans. It requires only one day to make the trip between the railway terminals. The pass is crossed at an elevation of 13,000 feet above sea level; but the route as surveyed for the railway provides for a tunnel through the mountains, which will reduce the altitude of the highest point reached by the railroad to considerably below that of the Cumbre, where the mule transports cross.—*Consular Reports*, May, 1903.

The Corinthian Canal.—A report upon the canal which connects the Gulf of Corinth with the Gulf of Aigina, cutting its way through the Isthmus of Corinth, or Megara, may not be considered of particular value to our own country in its proposed shortening of the sea distance between New York and San Francisco, as the canal of Corinth dwindles into insignificance when compared with either the Panama or Nicaragua water routes; yet the Corinthian Canal may be considered a miniature

of our projected transcontinental water route, and it is with this in view that I propose to give a few of its more important features. For statistics and other data, I am indebted to Mr. A. Raugabé, general secretary of the canal company in Athens, who has very courteously rendered much valuable assistance in the compilation of facts concerning the history and construction of the canal.

A few details as to the historical side of this undertaking may be of interest. I may note that in so far as the unsuccessful modern attempts are concerned, there are striking similarities between the canal of Corinth and the original Panama Canal, since both feats were undertaken and eventually abandoned by companies supported by French capital.

It was as early as 600 B. C. that Periander, tyrant of Corinth, proposed to cut his way through the little neck of land which was all that separated this city from the other centers of Greek trade; but he was confronted by too much superstition to make his scheme feasible. Both Julius Caesar and Caligula revived the canal scheme, but neither of these Romans succeeded in effecting anything. To the Emperor Nero falls the credit of the first decisive attempt to cut through the isthmus, and, from evidence still to be seen, the work was prosecuted with vigor, but was interrupted by his death. The resurrection of the scheme may be credited to many in later times—to the Venetians during their occupation of the Peloponnesus, to Governor Capodistria in the early days of Greek independence, to the Cretan engineer Lygouni, and especially to the Greek Government itself, which, in 1869, passed a law authorizing the construction of the canal. But it was not until 1881 that General Türr, aid-de-camp of King Victor Emanuel, obtained the necessary rights for beginning the work and organized a canal company with its seat in Paris.

The work began from the Corinthian side and was divided into five sections. Little difficulty was experienced in the first three, or about 4,700 meters (5,140) yards of the whole. With the same dispatch, also, the last section jutting upon the isthmian side was made ready. It was in cutting through the 300 meters (326 yards) which stretched between these portions—a section formed of material so hard that the use of dynamite failed to dislodge a single block—that the company met its greatest drawback, and notwithstanding the extension of time accorded for the completion of the contract, the society found itself out of funds and unable to continue the work. A new subscription was made, and the society dispensed with its costly machines—which were useless in cutting through the flintlike strata—and purchased

others which in the end proved as unavailable as the former ones. These and other expenses (notable among which must be recorded that of bridging the canal, at a cost of $80,000) rapidly reduced the newly subscribed capital, and in 1890 the society found itself again penniless and a receiver was appointed.

The failure of this company represented an outlay of almost $10,000,000. It was then that Mr. Syngros organized the present enterprise with a capital of 5,000,000 francs ($965,000), which rapidly, but not without hardships, completed the work. Assisted by the National Bank of Greece and the Cretan Industrial Bank, Mr. Syngros at once secured the necessary funds, and in spite of the solid rock yet to be cut through, the canal was completed three years after the failure of the old company and the formal inauguration celebrated in July, 1893. The canal shortens the distance between all points in the Adriatic and the Piræus more than 130 miles. It is not an expensive water route, and it brings Patras and Piræus, the two centers of the export and import trade—at both of which most vessels must touch—within twelve hours of each other. Yet with all these advantages, in an age when a day's time not infrequently decides the fate of competition, the picturesque water route is almost deserted by foreign craft, and the numerous vessels which come from the north and touch at Patras persist in braving the Greek coast line, the storms off the southern capes, and the twenty-odd hours' extra sailing to a use of the Corinthian Canal.

The reason is that the canal is poorly located. The winds which render the open gulf a raging sea do not subside at the approach to the water way. The canal is like a huge air shaft, and the mighty currents of air which rush from one gulf to the other are not calculated to encourage the mariner to run his ship between precipitous walls 260 feet high and separated by only 80 feet of sea.

A second obstacle takes the form of a reversing current, due to a striking variation in the tides of the two gulfs. The real difficulty, however, is the size of the canal itself; its width at the bottom is 68 feet 11 inches, and it has a depth of 26 feet 3 inches. The largest vessel to have used the canal, so far as I can learn, was the Italian cruiser *Giovanni Bausan*, of the following dimensions: Length, 275 feet; beam, 42.6 feet; draft, 18.4 feet; and tonnage, 3,068. However, vessels of 23.5 feet draft and 68.5 feet beam are permitted by the regulations to pass, which dimensions would include most of the steamers regularly trading in Greek waters. Nevertheless, the exacting pilotage which such dimensions render necessary, emphasized by the reversing currrent, has so far served to make the canal a much less appreciated

water route than it would have been in the days when steamships were more modest in their dimensions.

It is too late to think of changing the size of the route, but the other difficulties can be reduced, and it is probable that some effort will be made to remedy matters. At each approach the small breakwaters, while rendering necessary service, contribute to the difficulties of navigation, and are not sufficient to afford absolute protection to the canal.

General Plan of Isthmus

It is proposed to supersede these barriers by two large harbors that will make the approach less hazardous and will largely regulate the current. No action, I believe, has been taken, but some such plan is under consideration, although the extraordinary depth of the Gulf of Corinth will render the repairs very costly.

The harbor on the Corinthian side is formed by two arms running from each side of the isthmus and terminating in a line with the two sides of the channel, so that vessels entering are ready to steer ahead.

The isthmian habor is formed of but a single arm, which closes the channel entirely toward the mainland and requires the setting of a new course, both on entering and leaving the canal.

The span of the isthmus, as traced by the canal from gulf to gulf, is 6,432 meters (3.94 miles), and its greatest depth is 79.16 meters (259.7 feet). A solid block of masonry, some 6 feet in thickness, lines the base and sides of the channel to a height of 32.5 feet, or about 7 feet above the sea level, as a protection against the currents, its extremities making a substantial quay on each side from sea to sea. The sides of the channel have required no special protection of masonry, except in a few sections, notwithstanding their precipitous pitch. A passenger on one of the Greek steamers, looking up at the railroad bridge which crosses the canal at a height of 47 meters (122 feet) and is but 80 meters (262 feet) long from end to end, believes himself to be gazing almost straight upward, while the slopes of the deepest part of the channel, by reason of their greater height, rise like two perpendicular cliffs.

The slopes are protected from erosion by conduits which skirt the edge of the summits and carry away all surface water. Sixty electric lamps of 20 candlepower mark the channel at night, and on each side at distances of 600 feet are attached iron stanchions, to which ships may tie in case of accident or as a protection against a driving current.

If one of the present line of foreign steamers should decide that the twenty hours gained by using the canal are worth the saving at any price, or if a Greek line of steamers is fitted out to compete for a share in the far-sea trade, competition will drive the other lines in their wake, and the canal company will come into its share of the receipts which are literally going up in the smoke of every steamship which rounds Cape Matapan.—*Consular Reports*, May, 1903.

To Irrigate Ancient Babylon and Chaldea.—Sir William Willcocks, late Director General of Reservoirs, Egypt, and the designer of the great Assuan dam, has turned his attention to the project of reclaiming the wonderfully fertile valleys of the Tigris and Euphrates rivers, and proposes to make use of the canals and reservoirs which remain from an ancient civilization. This region was once known as the richest in the world, and its cities, Nineveh and Babylon, were the centers of a magnificent civilization, built upon the great agricultural resources of the valleys in which they were situated. It is pointed out that although desolation now reigns over a large part of the area under consideration, yet the land has steadily been gaining in fertility from the annual

overflows of the rivers and from the fact that no extensive agricultural operations have taken anything from the soil. With the Bagdad Railway completed to form a method of transportation, and a rebuilding of old irrigation works, the country could again take its place at the head of the agricultural regions of the world, for no other place is more favored for the production of cereal crops. Cane, cotton, and tobacco will grow in tropical abundance, and it is confidently expected that capital can be interested from the financial centers of Europe. Labor can be had in abundance and at a low wage from India.—*Forestry and Irrigation*, July, 1903.

Your Latitude While You Wait.—Foucault's pendulum may be easily employed in making a rough determination of latitude that is worth showing to high school pupils. The experiment recently exhibited with this object in the hall of the geological section of the Harvard University Museum, where the well of the stairway permitted the suspension of a pendulum 75 or 80 feet long. A small hole in the ceiling of the fifth floor, intentionally left open during the construction of the building, allowed this arrangement of a firm support for a fine brass wire on the attic floor. A leaden ball four inches in diameter was attached to the wire three and a half feet above the level of the ground floor. The deflection of the plane of swinging was easily noticed in ten or fifteen minutes without a more accurate basis of comparison than the lines on the floor beneath it; but by means of roughly constructed sights, the deflection was perceptible in ten or fifteen seconds.

An old lecture bench serves as a support on which a board a little less than ten feet long is pivoted at its middle: the top of the pivot, A (Fig. 1), is pointed and rises half an inch above the board. Vertical arms, B, C, are attached to the ends of the board; B has a vertical slit and C has a vertical line along the middle. By sighting first lengthwise and then sidewise, the pivot can be brought accurately under the stationary pendulum wire. As the pivoted board is likely to warp, it is convenient to have the arms attached to its end by two screws, one of which goes through a slot so that the arms can be set vertical again after they are tilted by the warping of the board.

The pendulum may be set swinging by burning a thread halter whose noose holds the ball and whose single end passes through the slit in arm B. For the first swing, the wire does not deviate from the line on C, when watched through the slit in B; but in three or four swings a deviation is easily noticeable.

The determination of latitude is as follows: At the pole, the pendulum

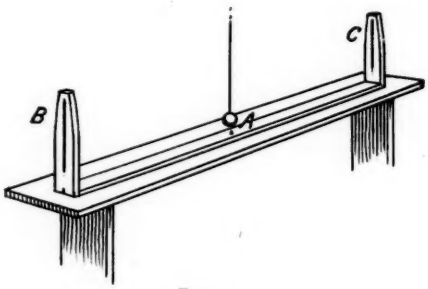

FIG. 1.

will make a complete rotation in 24 hours; or a deflection of one degree of arc in four minutes of time. Let the latter deflection be represented by the vertical line EF with respect to the line DE, (Fig. 2). Now having set the pendulum swinging, determine its deflection after any convenient interval by moving the pivoted board until the sights, BC, are again in the plane of swinging. If the distance from the pivot to the outer side of B is 4.775 feet, one degree of deflection will correspond to one inch of movement of B; this movement is readily measured by a mark at the base of B and an inch scale pasted on the bench. Suppose that a deflection of half a degree is found in 3¼ mintues: DH represents 3¼ minutes on the time scale DE, and HJ represents half a degree (EF having been taken arbirtarily to represent one degree). Draw DJK: then EK is the deflection that would have been found in the time (4 minutes) which produces one degree of deflection at the pole. With E as a center, and EF as a radius, draw the quadrant FG, and divide it into spaces of ten degrees of arc. Draw KL parallel to EG. Then the arc LG measures the latitude of the observer. The reason for this is that the rate of the deflection varies with the sine of the latitude, as is explained in text-books on physics. The result is, of course, not minutely accurate as thus determined, but it is edifying and amusing to have your latitude measured while you wait.

W. M. D.

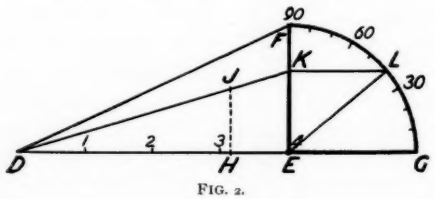

FIG. 2.

The British Antarctic Expedition.—Announcement has already been made in the JOURNAL of the preliminary results of the British Antarctic Expedition. A recent number of the *London Times*, as announced in *Science* for May 22, gives the following summary of the results thus far attained by the expedition:

1. The discovery of extensive land at the east extremity of the great ice barrier. 2. The discovery that McMurdo Bay (?) is not a 'bay,' but a strait, and that Mounts Erebus and Terror form part of a comparatively small island. 3. The discovery of good winter quarters in a high latitude—viz., 77° 50′ S., 166° 42′ E.—with land close by suitable for the erection of the magnetic observations, etc. The lowest temperature experienced was 92° of frost Fahrenheit. 4. An immense amount of scientific work over 12 months in winter quarters, principally physical and biological. 5. Numerous and extensive sledge journeys in the spring and summer covering a good many thousand miles, of which the principal is Captain Scott's journey, upon which a latitude of 82° 17′ south was attained, and an immense tract of new land discovered and chartered as far as 83° 30′ south, with peaks and ranges of mountains as high as 14,000 feet. 6. The great continental inland ice reached westwards at a considerable distance from the coast and at an altitude of 9,000 feet. 7. A considerable amount of magnetic work at sea, also soundings, deep sea dredging, etc.

Diamonds in the United States.—More than thirty millions of dollars worth of diamonds and other precious stones were brought into the United States during the fiscal year ending June 30, 1903.

This is the largest importation of diamonds and other precious stones ever shown in a single year of our commerce. Prior to 1887 the total had seldom if ever reached ten million dollars per annum; from 1887 to 1893 the total gradually moved upward until it reached sixteen millions, then it rapidly fell to five and one-half millions in 1894, seven and one-half millions in 1895, six and three-fourths millions in 1896, and two and one-half millions in the fiscal year 1897. In 1898 the total increased to nearly nine million dollars, in 1889 to over fourteen millions, in 1901 to twenty millions, in 1902 to twenty-three millions, and in 1903 will be fully thirty millions, making the total for the year just ended not only more than in any preceding year but fifty per cent in excess of 1901, double the figures of 1889 and more than six times the average during the period 1894-7.

This rapid growth in the importation of diamonds, while it suggests

general prosperity, also seems to indicate the development of a comparatively new industry in the United States, the cutting of diamonds. The total importations of diamonds alone in the eleven months ending with May amounted to twenty-four million dollars and of other precious stones to four and one-half millions. Of the twenty-four million dollars' worth of diamonds imported, ten millions were uncut diamonds; this total of ten millions of uncut diamonds is a large increase compared with the importations of uncut diamonds in preceding years, the figures for eleven months of the year 1902 being five and one-half millions.—*Reports of Bureau of Statistics.*

The Value of Weather Forecasts.—The habit of making positive statements without being in possession of the knowledge which alone gives one the right to make such statements is a very common one.

The value of the work of the Weather Bureau is very often questioned. It is a common statement that the weather is usually exactly the opposite of that predicted. This is surprising when we consider how easy it is to secure actual facts pertaining to this matter.

Frequent expressions of lack of belief in the practical value of the science of meteorology leads one to give the result of a little individual study.

It must be remembered that in Southern California we have practically one unbroken succession of clear days from May until November. There is little variation in barometric pressure, temperature or direction of the wind. At this season the forecaster can hardly fail. In order to make the test as severe as possible, I have not included any predictions between the first of May and the first of November.

The number of observations included in this study is not large, yet it is large enough to indicate with some accuracy the value of the work of the weather forecaster.

Number of Predictions	Condition Predicted	Number of Predictions Fulfilled	Per cent
100	Fair Weather	84	80—
49	Cloudy Weather	33	60—
38	Rain	31	80—
14	Frost	9	60—
5	Direction of Wind	5	100
Total 206		162	70—

J. F. C.

How to make a Relief Map of Flour.—Necessary Materials:

3 tablespoonfuls flour.
1 tablespoonful salt.
Water, sufficient to make dough.

Illustrative Lesson—A review of the surface of Europe.

After a few review questions each pupil spent a few minutes sketching the general outline of Europe. This was done while the chalk and molding boards were being passed. Then the outline of Europe was lightly drawn upon the boards with the chalk.

A cupful of moist sand was passed to each scholar, and Europe was molded. As the various ranges were located, they were first molded upon a large map that had been previously drawn and covered with sand. Each pupil then reproduced them upon his own map.

The flour maps were made at home and the pupils received these instructions: "Take the map that has been sketched upon paper, also your spelling papers." (These papers contained a list of all the divides to be located.) "After drawing the map upon stiff cardboard, paint the background either green or blue. Make dough, spread it upon the cardboard with a flat knife. Next, place mountains, referring to your spelling papers for the list."

This dough hardens and crystallizes, making a substantial map. Rivers can be drawn or even names printed upon it.

The Cornell Summer School of Geography.—The movement toward a better preparation of teachers of Geography in elementary and secondary schools has received a noteworthy impetus through the success of the Summer School of Geography and Geology, which has just closed at Cornell University, which was noted in this JOURNAL for May, 1903, p. 263. The idea of such a school originated with Professor Ralph S. Tarr, of Cornell University, one of the leaders in the promotion of good geographical teaching in America.

A few years ago geography was generally looked upon as an unimportant grammar school study; to teach it required little preparation beyond the instruction received in the grammar school. The change in sentiment is shown by the fact that the Cornell school offered sixteen different courses in geography and geology. Seven different men gave their time to the instruction. Among them were Professor Tarr, Professor Albert Perry Brigham of Colgate University, joint author of Gilbert & Brigham's Introduction to Physical Geography, and Professor Chas. A. McMurry of Illinois, the well known writer and teacher in the field of pedagogy. Principal Philip Emerson of Lynn, Mass., gave

two courses in commercial geography; Assistant Principal Frank Carney of the Ithaca High School gave two courses in field and laboratory work in physical geography; Mr. G. C. Matson of the Cornell faculty, two in corresponding work in geology, and Mr. R. H. Whitbeck of the New Jersey State Normal and Model Schools, two in geography method. The courses covered the field of geography and geology from the elementary work of the grades to advanced collegiate study.

Teachers from about twenty different states were in attendance; the large number of Normal school teachers being an especially encouraging feature. It was a noticeable fact that Doctors of Philosophy, college undergraduates, normal school teachers, superintendents, high school teachers, with apparently equal interest, listened to the same lectures, tramped side by side on the same field trips, and worked elbow to elbow in the same laboratory exercises.

The emphasis placed upon field and laboratory studies was one of the leading features of the summer school. Field excursions on foot and by boat or trolley, were taken Monday and Wednesday afternoons. Longer trips were taken on Saturdays by carriage, tally-ho, steamer, or train. Visits to factories, mills, department store, model farm, quarries, etc., were taken in connection with commercial geography on Tuesday and Thursday afternoons. Lectures were given from 8 A. M. to 1 P. M.

The cool weather and the large amount of outdoor work made it possible for teachers to apply themselves with a strenuousness altogether unusual in summer schools. A large number of those present took all of the lectures and nearly all of the field and laboratory work offered by the schedule. The enthusiasm was unabated from first to last, due in part perhaps to the recreative character of the field work. The beautiful Finger Lake region, in which Ithaca is situated, renders it an ideal place for geographical study. The lakes, the numerous rock-walled gorges, the waterfalls, the delta terraces perched high up on the hill sides, the hanging valleys, the terminal moraine, the sea of drumlins a little to the north, the kames and eskers to the east, the noted Taughannock falls, Havana Glen and Watkins Glen, combined with a great number of lesser geographical types, made a field of observation which evoked the constant admiration of all in attendance. Longer voluntary excursions were also made to the shores of Lake Ontario at North Fair Haven, to Niagara Falls and to the Anthracite fields of Pennsylvania.

One evening each week was given up to a Round Table Conference led by a member of the faculty. Among the topics discussed were: "The Nature and Scope of Geography," "Physical Geography in the

High School," "Geography in Normal Schools," "The Course of Study in Geography."

It cannot be doubted that the movement for improved geography teaching received a notable advance by the work of the school. It was the unanimous opinion that the Summer School of Geography should be continued next year and Professor Tarr is already planning for the enlargement of the scope of the work. R. H. W.

EDITORIAL

ARE WE NEGLECTING DRILL IN LOCATION IN OUR GEOGRAPHY CLASS?

IT was not many years ago that geography was considered as primarily a subject in which all the important questions could be introduced with Where? During the last decade teachers have been using Now and Why much more than Where, until it has come to be an open question whether location of places is not neglected in school geography work. Geography is not wholly a subject dealing with location or with causation. In our endeavor to give training in thinking and in seeing relations we ought not to forget that causes or effects not clearly located might as well be hypothetical, and that geography, if it is to be immediately helpful to the pupils, must give a basis for a correct understanding of current events. The parent who finds his fifth grade children absolutely ignorant of the location of the places in the United States noted in the evening paper, may well criticise unfavorably the "new fangled methods of teaching." School geography should not only be useful for the future but also in the present, and our courses of study and methods of teaching should be arranged from the standpoint of practicability as well as idealism.

In a recent examination for a large city high school the candidates were given an outline map of the United States and told to write in the names of the several states,—apparently as simple an exercise in location as could be devised. Of the twelve candidates four passed in correct maps. In the other cases the errors varied from four to thirty-four in number and the average of the eight was eighteen. This would seem to show that the several schools in which the candidates were trained were neglecting location drill. This striking instance may not be a good example but it shows what may be the result of one sided methods and should serve as a warning, especially to those teachers and superintendents who follow the "new" and neglect the "old."

REVIEWS

Handbook of Climatology. PART I. General Climatology. By Dr. Julius Hann. Translated with the Author's permission from the second revised and enlarged German edition, with additional references and notes, by Robert De Courcey Ward. Size, 9 x 5¼. Pp. xvi and 437. The Macmillan Company, New York, 1903. Price $3.00.

It is with pleasure that we greet the appearance of this, the first English translation of the most authoritative work on Climatology. The well known three-volume *Handbuch der Klimatologie*, first published in 1883 and given a second edition in 1897, forms a part of Professor F. Ratzel's "Library of Geographic Handbooks," and was immediately accepted as the standard reference book by all students of Climatology.

The present translation makes the most recent advances in Climatology, as they were set forth in the second edition of the German, easily accessible to all English-reading students and teachers. The intrinsic value of the original has been considerably increased by the addition of notes and references bearing on the most recent additions to our knowledge of Climatology, more particularly those due to the studies and researches of American investigators. This translation of the first volume of the original deals with the Principles of Climatology and the General Climatological Features of the Earth. The book is divided into two main parts. In Part I Climate is defined, the aims and methods of Climatology are clearly but simply set forth, and the Climatic Factors are individually discussed from a general standpoint. The discussions of the prevailing and the proper methods for observing and working up the various climatic elements will prove of value to teachers and students alike.

In Part II the subject of General Climatology is discussed in three sections. Section I treats of Solar or Mathematical Climate, i. e., of Climate in so far as it is controlled by the shape of the Earth, its position and its movements in relation to the Sun. In Section II the chief varieties of Physical Climate, or Climate as it is modified by the physical features of the Earth, come in for discussion and they are divided into three great classes, viz.: Continental, Marine and Mountain Climate. The two former classes, grouped together by the translator, naturally form the greater portion of the volume. First comes a chapter on the influence of Land and Water upon the distribution of Temperatures. This is followed by two chapters which discuss the influence of Continents upon Atmospheric Humidity and Winds. Chapters X and XI treat of the relations between Climate and Ocean Currents, and Forests, respectively. The clear, concise summary of existing views upon the question of Forests and Climates given in Chapter XI, and its numerous references to American publications will make this chapter particularly valuable to Americans. The subdivision closes with a chapter on the Mean Temperature of the Parallels and of the Hemispheres. In the eight chapters of the second division the subject of Mountain Climate receives concise but thorough discussion. This portion will be of special value to many of our students just now since we are beginning to study more closely the climatic features of the mountainous portions of America. Particularly will this be true for the students of the varied resources of Alaska, now being so rapidly made known to us by the work of the U. S. Geological Survey.

Section III closes the volume with two interesting chapters on the various endeavors to show that Climatic Changes are going on upon this earth.

The typography, arrangement and illustrations of the volume will commend it to the teachers who must often use it as a work of reference. The tabular presentation of the figures illustrating many of the phenomena discussed in the text

and the Model Climatic Tables for Vienna, will also prove very useful. Numerous footnotes give references to the most important among the older and the modern works and make the book really almost indispensable to the average student who cannot use the manuscript bibliography of the United States Weather Bureau. It is sincerely to be hoped that the fact of the translator having adhered to the Centigrade and Metric scales used in the original will not be allowed to tell against the general introduction of the book into all our school libraries. For the convenience of those not already sufficiently familiar with the scales used, the translator has added Conversion Tables as an Appendix.

In conclusion sincere thanks are due Professor Ward from the English-speaking peoples for the service he has rendered them in translating this work. It deserves a place in every school and college library and in the private library of every person who wishes to keep abreast of the constantly increasing knowledge of our climate. Together with Ward's *Practical Exercises in Meteorology* and Davis *Elementary Meteorology* we now have three excellent and authoritative guides in the most important fields of study dealing with the Atmosphere. C. A., Jr.

How We Are Fed. A Geographical Reader. By James Franklin Chamberlain Size, 4½ x 6. Pp. xii and 214. The Macmillan Company, New York, 1903. Price 40c.

Professor Chamberlain's *How We Are Fed* covers a field which has hitherto been practically neglected in America, although the general ground has been covered in England by Lyde's well known and useful book, *Man and His Markets*. Considering the need in this country for a reader for fourth and fifth grade children dealing with the story of the articles used on our tables daily, it is to be regretted that the book under review does not more adequately meet the requirements of what such a book should be. The several articles are too general to be of permanent value, and the author has adopted a style which does not appeal to healthy-minded children. Children of the age who could use this book do not care to have impersonal objects described as personalities, and they object to moral lessons boldly introduced in what is supposed to be informatical reading. In other words, the book is presented in an unappealing form. The illustrations are as a rule well selected and fairly well produced.

The best chapters are those dealing with the products raised outside our own country, for in these chapters are the clearest, most complete and instructional descriptions. For lack of a better volume, this book will serve a good purpose in elementary work if selected chapters only are used. As a supplementary reader, however, it is an inadequate companion to the geographies published by the same company in which industries and industrial life are so fully and successfully treated.
R. E. D.

RECENT PUBLICATIONS

Geographen-Kalender, 1903–1904. By Hermann Haack. Pp. 414, 16 maps. Justus Perthes, Gotha.

A small reference volume giving the chief geographical events for 1902, and summarizing the geographical expeditions and literature for the same year. Fifty-five pages are devoted to school geography in 1902, and one hundred and twenty-four pages are given to a list of the geographers of the world and their addresses.

The book also includes nearly one hundred pages of statistics in reference to the chief countries of the world.

An invaluable book of reference for all geographers, and should be in the library of every college and normal school.

The Great Siberian Railway from St. Petersburg to Peking. By Michael M. Shoemaker. Pp. viii and 243. G. P. Putnam's Sons, New York, 1903.

An interesting account of a trip over the Great Siberian Railway, in which a good description is given of the country traversed and the people seen along the route. The chapters devoted to Lake Baikal, Peking, Port Arthur and Dalny are very helpful, well written and illustrated.

The Philippine Islands, 1493–1803. Vol. I, 1493–1529, translated from original manuscripts by Emma H. Blair and James A. Robertson. Pp. 356, with map. Arthur H. Clark Company, Cleveland, 1903.

An authoritative and seemingly inclusive account of conditions in the Philippine Islands from 1493–1529. A volume for the student of the history of geography and the Philippines.

Geology and Geography of Minnesota. Vol. I. Geography of Minnesota. By Christopher W. Hall. Pp. xi and 299. H. W. Nelson Co., Minneapolis, 1903.

An illustrated popular account of the geography of Minnesota. To be reviewed later.

NEWS NOTES

The First United States Cable across the Pacific was completed and formally opened on July fourth. This is the second cable across the Pacific to be completed and opened within a few months, the British Cable from Vancouver to Australia having been in operation since the early part of 1903.

The International Geographical Congress will meet in Washington in September, 1904. A committee consisting of representatives of all the leading geographical societies of the country is now at work on the plans for the meeting. The chairman of the committee is Mr. W. J. McGee, the eminent ethnologist and geographer of Washington, D. C. This is the first meeting of the Congress in the Western Hemisphere, and it is to be hoped that all interested may coöperate to make this important gathering of scientists an eminent success.

The Editor notes with regret the sudden death in April of Miss Alicia De Riemer, whose article on the "Educational Value of Geographical Exhibitions" appeared in the March number of the JOURNAL. Miss De Riemer was an enthusiast in geography, and had done especially valuable work in the popularization of meteorology. She had been in close touch with the work of this JOURNAL and its predecessor for several years.

Mention has already been made in these columns of the work of the British Antarctic Expedition, preliminary returns of which have been received and published during the spring. There are now four expeditions in the extreme southern regions. These are known as the German Expedition, the Scotch Expedition, the Swedish Expedition, and the British Antarctic Expedition. A good summary of the equipment of the several expeditions and of the objects sought by them appears in the *Monthly Weather Review* for April, 1903, pp. 187–188.

Without Maps
True Geographical Teaching
is Impossible

Guyot

MAP I. *THE FRONTIER OF 1790*

The shaded area is that where the population was over eighteen per square mile; the enclosed unshaded areas were populated with from two to eighteen per square mile. Notice how the population moved westward along three regions (by the four routes mentioned); also the "islands" of settlements in the limestone regions. (See article: "The Correlation of Geography and History," by Allen, page 404.)